A Summary Account given by Dr. John Wallis, *of the General* Laws *of* Motion, *by way of Letter written by him to the Publiſher, and communicated to the* R. Society, Novemb. 26. 1668.

PEtis, V. C. ut quæ mea ſunt de Motibus æſtimandis Principia, paucis aperire velim. Id autem, ſi meminiſti, jam olim factum eſt, non modo in illo *Opere*, quod ante octo menſes *R. Societati* exhibitum, eorum juſſu prælo ſubjectum eſt; ſed & jamdudum in duobus ſcriptis eidem *Societati* ante plures Annos exhibitis, quæ & Te penes ſunt: Quorum alterum, ex generalibus Motus Principiis, rationem reddit, quî fieri poſſit, ut Homo flatu ſuo (Veſicam inflando) ſaltem Centipondium elevare potis ſit (quod Experim. ante 16. vel 18. annos *Oxoniæ* exhibitum, coram Ipſis aliquoties fuit repetitum;) Alterum, varia de Experim. *Torricelliano* dicto, Phænomena, ex principiis Hydroſtaticis exponit.

Summa rei huc redit:

1. Si Agens ut A efficit ut E; Agens ut 2 A, efficiet ut 2 E; 3 A, ut 3 E, &c. cæteris paribus: Et, univerſaliter, *m* A ut *m* E; cujuſcunq; rationis Exponens ſit *m*.

2. Ergo, ſi Vis ut V moveat Pondus P; vis *m* V ut movebit *m* P, cæter. paribus: puta, per eandem Longitudinem eodem Tempore, *h.e.* eadem Celeritate.

3. Item, ſi Tempore T. moveat illud per Longitudinem L, Tempore *n* T movebit per Longitudinem *n* L.

4. Adeoque, ſi Vis V, tempore T, moveat Pondus P, per Longitudinem L; Vis *m* V, Tempore *n* T, movebit *m* P, per Longitud. *n* L. Et propterea, ut V T (factum ex viribus & tempore) ad P L (factum ex pondere & Longitudine) ſic *m n* V T, ad *m n* P L.

5. Quoniam Celeritatis gradus ſunt Longitudinibus eodem Tempore tranſactis Proportionales, ſeu (quod eodem recidit) reciproce Proportionales Temporibus eidem Longitudini tranſigendæ impenſis: erit $\frac{L}{T} \cdot C :: \frac{m\,L}{n\,T} \cdot \frac{m}{n} C$. h. e. Gradus Celeritatum, in ratione compoſita ex Directa Longitudinum & Reciproca Temporum.

6. Ergo, propter V T. P L :: *m n* V T. *m n* P L: erit $V.\frac{P\,L}{T} :: m\,V.\frac{m\,n\,P\,L}{n\,T}$: h. e. V. P C :: *m* V. *m* P C = *m* P × C = P × *m* C.

7. Hoc eſt, ſi Vis V movere potis ſit Pondus P, Celeritate C: Vis *m* V movebit vel idem Pondus P, Celeritate *m* C; vel eadem Celeritate, Pondus *m* P; vel denique quodvis Pondus ea Celeritate, ut factum ex Pondere & Celeritate ſit *m* P C.

8. Atque hinc dependet omnium Machinarum (pro faciſitandis motibus) conſtru-

conſtruendarum ratio: nempe, ut qua ratione augetur Pondus, eadem minuatur Celeritas; quo fiat, ut Factum ex Celeritate & Pondere, eadem Vi movendo, idem ſit: puta V. P C :: V. m P $\times \frac{1}{m}$ C $=$ P C.

9. Si Pondus P, Vi V, Celeritate C, latum, in pondus Quieſcens (non impeditum) m P directe impingat; ferentur utraque Celeritate $\frac{1}{1+m}$ C. Nam, propter eandem Vim, majori Ponderi movendo adhibitam, eadem ratione minuetur aucti Celeritas: nempe V. P C :: V. $\frac{1+m}{1}$ P $\times \frac{1}{1+m}$ C $=$ P C. Adeoque Alterius Impetus (intellige factum ex Pondere & Celeritate) fiet $\frac{1}{1+m}$ P C; Reliqui $\frac{1}{1+m}$ m P C.

10. Si in Pondus P, (Vi V) Celeritate C latum, directe impingat aliud, eadem via, majori Celeritate inſequens; puta Pondus m P, Celeritate n C, (adeoque Vi mn V latum; ferentur ambo Celeritate $\frac{1+mn}{1+m}$ C. Nam V. P C :: mn V. mn P C :: V $+ mn$ V $= \frac{1+mn}{1}$ V. $\frac{1+mn}{1}$ P C $= \frac{1+m}{1}$ P $\times \frac{1+mn}{1+m}$ C. Adeoque præcedentis Impetus fiet $\frac{1+mn}{1+m}$ P C; ſubſequentis, $\frac{1+mn}{1+m}$ m P C.

11. Si Pondera contrariis Viis lata, ſibi directe occurrant ſive impingant mutuo, puta, Pondus P (Vi V) Celeritate C, dextrorſum; & Pondus m P, Celeritate n C (adeoque Vi mn V) ſiniſtrorſum: Utriuſque Celeritas, Impetus, & directio, ſic colliguntur. Pondus dextrorſum latum, reliquo ſi quieſceret, inferret Celeritatem $\frac{1}{1+m}$ C, adeoque Impetum $\frac{1}{1+m}$ m P C, dextrorſum, ſibique retineret hanc eandem Celeritatem, adeoque Impetum $\frac{1}{1+m}$ P C dextrorſum (per *Sect.* 9.) Ponduſque ſiniſtrorſum latum (ſimili ratione) reliquo ſi quieſceret, inferret Celeritatem $\frac{mn}{1+m}$ C, adeoque Impetum $\frac{mn}{1+m}$ P C ſiniſtrorſum; ſibique retineret hanc eandem Celeritatem, adeoque Impetum $\frac{mn}{1+m}$ m P C ſiniſtrorſum. Cum itaque motus utrinque fiat; Impetus dextrorſum prius lati, jam aggregatus erit ex $\frac{1}{1+m}$ P C dextrorſum, & $\frac{mn}{1+m}$ P C ſiniſtrorſum; adeoque re adſe vel dextrorſum vel ſiniſtrorſum, prout ille vel hic major fuerit, eo impetu qui eſt duorum differentia: h. e. (poſito $+$ ſigno dextrorſum, & $-$ ſiniſtrorſum ſignificante,) Impetus erit

$+$

$+\frac{1}{1+m}PC-\frac{mm}{1+m}PC=\frac{1-mn}{1+m}P$; Celeritas $\frac{1-mn}{1+m}C$; (adeoque Dextrorum vel ſiniſtrorſum, prout 1 vel mn major fuerit.) Et ſimiliter Impetus ſiniſtrorſum prius lati, erit $+\frac{1}{1+m}mPC-\frac{mn}{1+m}mPC=\frac{1-mn}{1+m}mPC$; Celeritas $\frac{1-mn}{1+m}C$: Adeoque dextrorſum vel ſiniſtrorſum, prout 1 vel mn major fuerit.

12. Si vero Pondera nec eadem directe via procedant, nec directe contraria, ſed oblique ſibi mutuo impingant; moderandus erit præcedens Calculus pro obliquitatis menſura. Impetus autem *oblique* impingentis, ad ejuſdem Impetum qui eſſet ſi *directe* impingeret (cæter. paribus) eſt in ea ratione qua Radius ad Secantem anguli Obliquitatis; (Quod etiam intelligendum eſt, ubi Perpendiculariter, ſed Oblique cadit in percuſſi ſuperficiem non minus quam ubi viæ motuum ſe mutuo Oblique decuſſant:) Quæ quidem Conſideratio, cum Calculo priori debite adhibita, determinabit, quænam futura ſint ſic Oblique impingentium Celeritas, Impetus, & directio, h. e. quo Impetu, qua Celeritate, & in quas partes ab invicem reſilient, quæ ſic impingunt. Eademque eſt ratio Gravitationis gravium Oblique deſcendentium, ad eorundem Perpendiculariter deſcendentium Gravitationum. Quod alibi demonſtramus.

13 Si quæ ſic impingunt Corpora, intelligantur non abſolute dura (prout hactenus ſuppoſuimus) ſed ita ictui cedentia, ut *Elaſtica* tamen vi ſe valeant reſtituere, hinc fieri poterit ut a ſe mutuo reſiliant ea corpora, quæ ſecus eſſent ſimul proceſſura; (& quidem plus minuſve, prout hæc vis reſtitutiva major minorve fuerit,) nempe ſi Impetus ex vi reſtitutiva ſit progreſſiva major.

In motibus acceleratis & retardatis, Impetus pro ſingulis momentis is reputandus eſt, qui gradui Celeritatis tum acquiſito convenit. Ubi autem per Curvam fit motus, ea reputanda eſt, in ſingulis punctis, motus directio, quæ eſt Rectæ ibidem Tangentis. Et ſi quando motus tum acceleratus vel retardatus fit, tum & per Curvam fiat (ut in Vibrationibus Penduli;) Impetus æſtimandus erit, pro ſingulis punctis, ſecundum tum gradum accelerationis, tum Obliquitatem ibidem Tangentis.

Atque hæ ſunt (quantum Ego judico) Generales Motuum Leges; quæ ad Caſus particulares Calculo ſunt accommodandæ. Quos tamen, ſi ſigillatim perſequi vellem Epiſtolæ limites tranſilirem: Neque commode fieri poteſt ſcire *Schematum* apparatu, quibus hic abſtinendum putavi. *Vale. Oxon. d.* 15. *Novemb.* 1668.

Dr. Chriſto-

Dr. Chriſtopher Wrens

Theory concerning the ſame Subject; imparted to the R. Society Decemb. 17. *laſt, though entertain'd by the Author divers years ago, and verifi'd by many Experiments, made by Himſelf and that other excellent Mathematician* M. Rook *before the ſaid Society, as is atteſted by many Worthy Members of that Illuſtrious Body.*

Lex Naturæ de Colliſione Corporum.

VElocitates Corporum propriæ & maxime Naturales ſunt ad Corpora reciproce proportionales.

Lex Naturæ.

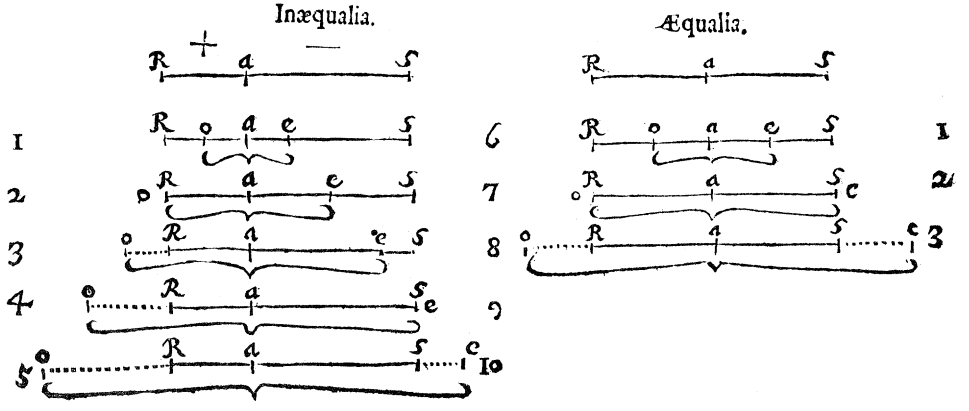
Itaque Corpora R. S. *habentia proprias Velocitates, etiam poſt Impulſum retinent proprias.*

Et Corpora R. S. *improprias Velocitates habentia ex Impulſu reſtituuntur ad Æquilibrium; hoc eſt, Quantum* R *ſuperat, &* S *deficit à propria Velocitate ante Impulſum, tantum ex Impulſu abſtrahitur ab* R *& additur ipſi* S *& e contra.*

Quare Colliſio Corporum proprias Velocitates habentium æquipollet Libræ oſcillanti ſuper Centrum Gravitatis.

Et Colliſio Corporum improprias Velocitates habentium æquipollet Libræ ſuper bina Centra æqualiter huic inde à Centro Gravitatis diſtantia: Libræ vero Jugum, ubi opus eſt, producitur.

Itaque Corporum æqualium impropriè moventium tres ſunt caſus. Corporum vero inæqualium impropriè moventium (ſive ad contrarias ſive ad eaſdem partes) decem ſunt omnino Caſus, quorum quinque oriuntur ex Converſione.



R S Cor-

R S *Corpora æqualia, vel* R *corpus majus*, S *corpus minus.*
a *Centrum Gravitatis ſive anſa Libræ.* Z *ſumma velocitatum utriuſque corporis.*

$$\left.\begin{matrix} Re \\ Se \end{matrix}\right\} \textit{veloc. corp.} \left\{\begin{matrix} R \\ S \end{matrix}\right\} \textit{ante impulſum data} \Big) \textit{ vel } \Big(\left\{\begin{matrix} So \\ Ro \end{matrix}\right\} \textit{veloc. corp.} \left\{\begin{matrix} S \\ R \end{matrix}\right\} \textit{ante impulſ data.}$$

$$\left.\begin{matrix} OR \\ OS \end{matrix}\right\} \textit{veloc. corp.} \left\{\begin{matrix} R \\ S \end{matrix}\right\} \textit{poſt impulſ. quæſita} \Big) \Big(\left\{\begin{matrix} eS \\ eR \end{matrix}\right\} \textit{veloc. corp.} \left\{\begin{matrix} S \\ R \end{matrix}\right\} \textit{poſt impulſ. quæſita.}$$

[*Lege ſyllabas* (*quamvis disjunctas*) R e S e o R o S *vel* R o S o e S e R *in Linea cujuſlibet Caſus, & harum quæ ſcribitur in* Schemate *more* Hebraico, *ea indicat motum contrarium motui, quem notat cujuſvis ſyllabæ ſcriptio* Latina: *Syllaba conjuncta quietem Corporis denotat.*]

Calculus
$$\begin{matrix} R+S:S::Z:Ra \\ R+S:R::Z:Sa \end{matrix} \Big| \begin{matrix} Re - 2Ra = oR \\ 2Sa + Se = oS \end{matrix} \Big| \begin{matrix} So - 2Sa = eS. \\ 2Ra + Ro = eR. \end{matrix}$$

Natura obſervat regulas Additionis & Subductionis Specioſæ.

An Account of two Books.

I. HISTORIA CÆLESTIS; Ex Libris & Commentariis M. Stis. Obſervationum Vicennalium TYCHONIS BRAHE, *Dani*, Auguſtæ Vindelic. *An.* 1666. *in Folio.*

THeſe Obſervations of the Noble *Tycho*, as they were procured and preſerv'd by thoſe Three Mighty Emperours, RUDOLPH. II. FERDINAND. II. and III; ſo they were lately by the Command of his Imperial Majeſty LEOPOLD made publick. They are uſher'd in by a *Liber Prologomenos*, compendiouſly repreſenting the Obſervations made from the time of the very Infancy of Aſtronomy unto that of its Reſtauration by the Illuſtrious *Tycho*; and reduced into 7. Claſſes, *viz.*

1. The *Babylonian* Obſervations; from *A.* before Chriſt 721. unto *A.* 432.

2. The *Grecian*; from *A.* before Chriſt 432. unto the beginning of the Vulgar Chriſtian Account.

3. The *Alexandrian*; from *A. Chriſti* 1. until *A.* 827.

4. The *Syro-Perſian*; from *A. C.* 827. unto 1457.

5. The *Norimbergian*; from *A. C.* 1457. unto 1509.

6. The